CLAIMS

1. An optical disk apparatus comprising:

a motor for rotating an optical disk;

a light source;

diffraction means for diffracting a portion of light emitted from the light source to form a main beam of 0^{th} order light and a pair of sub beams composed of $+1^{st}$ order light and -1^{st} order light which are formed on both sides of the 0^{th} order light;

an objective lens for converging the main beam and the pair of sub beams onto the optical disk;

light receiving means for receiving the main beam and the sub beams reflected from the optical disk, and outputting electrical signals through photoelectric conversion;

a calculation section for, based on the electrical signals output from the light receiving means, providing a main push-pull signal MPP, a sub push-pull signal SPP, and a differential signal between the main push-pull signal MPP and the sub push-pull signal SPP; and

phase difference detection means for detecting a phase difference between the main push-pull signal MPP and the differential signal,

wherein, in accordance with an output from the phase difference detection means, an offset is applied in a tracking control of the main beam with respect to the optical disk to compensate for an off-tracking caused by a phase shift of the differential signal.

2. The optical disk apparatus of claim 1, wherein the differential signal is a differential push-pull signal DPP.

3. The optical disk apparatus of claim 2, wherein the light receiving means comprises:

a main-beam photodetector having four split photoelectric conversion sections for receiving the main beam reflected from the optical disk;

a first sub-beam photodetector having two split photoelectric conversion sections for receiving one of the pair of sub beams; and

a second sub-beam photodetector having two split photoelectric conversion sections for receiving the other of the pair of sub beams, and

the calculation section further comprises:

first calculation means for determining the main push-pull signal MPP=(A+D)-(B+C), based on signals A, B, C, and D obtained respectively from the four split photoelectric conversion sections of the main-beam photodetector;

second calculation means for determining the sub push-pull signal SPP=(F-E)+(H-G), based on signals E and F obtained respectively from the two split photoelectric conversion sections of the first sub-beam photodetector and on signals G and H obtained respectively from the two split photoelectric conversion sections of the second sub-beam photodetector; and

third calculation means for determining the differential push-pull signal DPP=MPP- α ×SPP (where α is a constant), based on outputs from the first calculation means and the second calculation means.

4. The optical disk apparatus of any of claims 1 to 3, comprising:

signal amplitude calculation means for adjusting amplitudes of the main push-pull signal MPP and/or the sub push-pull signal SPP so that the amplitude of the main push-pull signal MPP and the amplitude of the sub push-pull signal SPP become equal;

signal summation means for calculating a sum of the main push-pull signal MPP and the sub push-pull signal SPP which are output from the signal amplitude calculation means; and

phase difference calculation means for, based on an output from the signal summation means, calculating a phase difference between the main push-pull signal MPP and the sub push-pull signal SPP.

5. An optical pickup device comprising:

a light source;

diffraction means for diffracting a portion of light emitted from the light source to form a main beam of 0^{th} order light and a pair of sub beams composed of $+1^{st}$ order

light and -1^{st} order light which are formed on both sides of the 0^{th} order light;

an objective lens for converging the main beam and the pair of sub beams onto the optical disk;

light receiving means for receiving the main beam and the sub beams reflected from the optical disk, and outputting electrical signals through photoelectric conversion;

a calculation section for, based on the electrical signals output from the light receiving means, providing a main push-pull signal MPP, a sub push-pull signal SPP, and a differential signal between the main push-pull signal MPP and the sub push-pull signal SPP; and

phase difference detection means for detecting a phase difference between the main push-pull signal MPP and the sub push-pull signal SPP,

wherein, in accordance with an output from the phase difference detection means, an offset is applied in a tracking control of the main beam with respect to the optical disk to compensate for an off-tracking caused by a phase shift of the differential signal.

6. A driving method for an optical disk, comprising:

a step of converging a main beam and a pair of sub beams onto an optical disk and outputting electrical signals based on the main beam and the sub beams reflected from the optical disk;

a step of, based on the electrical signals, providing a main push-pull signal MPP, a sub push-pull signal SPP, and a differential signal between the main push-pull signal MPP and the sub push-pull signal SPP; and

a step of detecting a phase difference between the main push-pull signal MPP and the differential signal,

wherein, based on the phase difference, an offset is applied in a tracking control of the main beam with respect to the optical disk to compensate for an off-tracking caused by a phase shift of the differential signal.

7. The driving method for a disk of claim 6, wherein the differential signal is a differential push-pull signal DPP.

8. The driving method for a disk of claim 6, wherein the step of providing the differential signal comprises:

a step of determining the main push-pull signal MPP=(A+D)-(B+C), based on signals A, B, C, and D obtained respectively from four split photoelectric conversion sections of a main-beam photodetector;

a step of determining the sub push-pull signal SPP=(F-E)+(H-G), based on signals E and F obtained respectively from two split photoelectric conversion sections of a first sub-beam photodetector and on signals G and H obtained respectively from two split photoelectric conversion sections of a second sub-beam photodetector; and

a step of determining the differential push-pull signal $DPP=MPP-\alpha \times SPP$ (where α is a constant).